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PIC/D-2/61
4 January 1961

MEMORANDUM FOR: Chief, DPD/Logistics

ATTENTION : [redacted]

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SUBJECT : General Planning Paper for DPD/Logistics

During our discussion on 5 December 1960, it was agreed that PIC would sketch a general planning paper on which to base our future requirements for logistics support in building photographic exploitation equipment.

1. GENERAL:

PIC develops much of its equipment for exploitation of aerial photography based on the input parameters outlined by DPD. Roughly the following are the rules of thumb by which to gauge the complexity and cost of this equipment:

a. Resolution. This is the primary consideration in planning for the engineering needed to produce exploitation equipment. PIC needs lenses which are three times the quality of the input produced by the DPD system; i.e., if DPD delivers a product to PIC which contains 100 l/mm, the exploitation gear produced by PIC must have lenses capable of 300 l/mm.

b. Ground Measurements. The second parameter deals with the resolved ground measurement and the density of targets covered. A collection system which produces 20' - 30' ground resolution and a million square miles or more coverage per mission probably will require less intelligence exploitation time than a system which produces a round resolution of 10' and only 250,000 square miles of coverage with the same film quality. Roughly speaking, there is eight times as much work involved in exploiting the latter because more detail is carried in the photography. To cope with this increase in workload, more units of equipment in which the engineering parameters are identical are required.

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c. The other factors which I shall lump together that must be considered for high acuity systems become critical above 60 l/mm. These factors are illumination, projection distance, magnification, vibration, and contrast. For instance, the thumb rule for magnification for scanning of first phase interpretation is for the equipment produced to reduce the inherent resolution of the input to a resolved 4 l/mm at 10" viewing distance. This is generally true for both optical viewing and projected viewing. Optical viewing provides a good presentation but is uncomfortable to the operator and is strictly a one-man operation, while projection viewing allows several people with different backgrounds to view the same imagery with ease. In the case of the latter, present screen materials reduce the contrast so that much of the resolved detail is lost to the viewer. These problems are being worked on currently by our Research and Development Staff to produce higher quality screens which retain the contrast differences required to see the minimum ground object sizes resolved in the original material.

2. SPECIFIC PROBLEMS:

The planned system inputs to PIC in the very near future will require considerable research and development in order to make them fully exploitable by human beings. Generally speaking, within the next six months we can expect a doubling of resolution. If our estimate of the first results of this present system are correct, we achieved an average of 60 l/mm and it is felt that we were granularity limited. This means that with the probable increase which the new film provided on the last input, an average of between 80-100 l/mm resulted. With a major lens and film change, such as is contemplated in C''', we will not only gather a tremendous advance from the fine granular structure of the film that is anticipated, but also a doubling of the resolution. If the theoretical resolution is doubled this will make 150 l/mm, but because there are always some minor degrading factors such as IMC, etc., even 120 l/mm as an end product input is going to be a considerable advance and represents major equipment changes.

By 1962 we can anticipate not only a major advance in resolution to nearly 200 l/mm resolution, but in ground object sizes of 1' - 2' resolved. I think it is readily apparent that significant progress must be made in the overall programming of collection/exploitation systems, including equipment parameters, in order to accommodate this tremendous advance in





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technology. It is my understanding that between now and June 1962, if the SAMOS Program gets into the E-5 and E-6 packages, these too will require equipment which is capable of exploiting from between 100 and 200 l/mm. The tremendous work-loads involved in the advances outlined will result in an equipment program which must be embarked on in the very near future and will run in excess of three million dollars. The lead time to produce this equipment is already too short. We are unable to even plan or budget for such unplanned for advances as are due prior to the 1962 deadline, (e.g. C'''). It is expected that equipment development and modification of existing equipment to meet these immediate needs will cost between 1 and 2 million dollars. We are currently engaged in a crash program of attempting to bring our present equipment up-to-date so that we can exploit 100 l/mm. This is an interim measure and though inadequate is the very best that can be done in the short lead time that we have left. It is not anticipated that we will need any additional contacting through DPD/Logistics for this effort.

We are going to concentrate, however, on creating a capability for 200 l/mm at the very earliest date. This may be a combination of equipment by Eastman Kodak, Itek and possibly Perkin-Elmer for which we would expect to do our contracting through DPD/Logistics. I would assume that security and contractual considerations will make necessary continuing DPD assistance and, furthermore, there may be unplanned for funding involvements.

Our current thinking in the field of resolution transfer will probably require considerably more work at the processing site in the form of very high quality continuous projection enlargement of the original material (see CINEMAT concept and recent RK proposal for 2.5 X enlarging printer). I hope this paper answers some of your problems and will serve as a guide for our future needs.

[redacted]

SA/R & D
Photographic Intelligence Center

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